

REMARKS

The Office Action mailed November 7, 2000, has been received and reviewed. Claims 23 through 28 are currently pending in the application. Claims 23 through 28 stand rejected. Applicants have amended claims 24, 25, 26, and 28, and respectfully request reconsideration of the application as amended herein.

35 U.S.C. § 112 Claim Rejections

Claims 24 and 28 stand rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Applicants have amended claims 24 and 28 to overcome this rejection. The amendments to claims 24 and 28 find support in the Specification at page 7, lines 5 through 21, and at page 9, lines 23 through 28.

Claims 25 through 28 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. Applicants have amended claims 25 and 26 to overcome the rejection by replacing the term "semiconductor" with the term "silicon." These amendments find support in the Specification at page 4, lines 21 through 22; page 6, lines 27 through 28; page 8, lines 25 through 26; and at page 9, lines 17 through 18.

Claim 26 also stands rejected because the phrase "said dielectric layer" lacks antecedent basis. Claim 26 is amended to overcome this rejection.

35 U.S.C. § 102(b) Anticipation Rejections

Anticipation Rejection Based on U.S. Patent No. 5,428,244 to Segawa et al.

Claims 23 through 28 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Segawa et al. (U.S. Patent No. 5,428,244). More specifically, claims 23 through 28 are allegedly anticipated because Segawa et al. teaches the deposition of a metallic silicide film in a temperature range between 650°C and 700°C. Applicants respectfully traverse this rejection, as hereinafter set forth.

It is well established that a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Segawa et al. fails to anticipate claims 23 through 28 because Segawa et al. does not describe each and every element of the claims of the present invention.

Contrary to the Examiner's contentions, Segawa et al. does not disclose a gate stack comprising a non-crystalline or amorphous metallic silicide film. The Official Action references FIG. 12 of Segawa et al. (which corresponds to Example VII) in support of the contention that Segawa et al. teach the existence of a non-crystalline film (4) in a gate stack structure. As the Official Action indicates, Segawa et al. does teach the initial deposition of a metallic silicide film at a temperature of from 500° to 600°C. However, this metallic silicide film described by Segawa et al. is only an intermediary metallic silicide film which is crystallized prior to formation of the final product. More specifically, Segawa et al. teaches a subsequent heat treatment "carried out at 850° to 950° C for the activation of the impurities, the crystallization of the WSix film 4, and the planarization of the interlevel layer." *See, Segawa et al.*, col. 14, lines 1-4 (emphasis added). Thus, Segawa et al. expressly teaches that the silicide film is crystallized in the final product. The fact that Segawa et al. teaches a non-crystalline intermediary metallic

silicide film does not anticipate a gate stack having a non-crystalline metallic silicide film because the intermediary non-crystalline film of Segawa et al. is crystallized before the final gate stack is formed. In light of this express teaching, the basis for the anticipation rejection is unfounded.

Furthermore, even if the unsupported interpretation “that the temperature required to anneal tungsten silicide to become crystalline is higher than 850°C” is true, Segawa et al. teaches a required heat treatment step which is higher than 850°C, necessarily resulting in a crystalline metallic silicide film.

Claims 23, 25, and 27 of the present invention each recite a gate stack having a “non-crystalline metallic silicide film” which is not described by Segawa et al. Instead, the intermediary non-crystalline metallic silicide film described by Segawa et al. is subject to a heating cycle to form a semiconductor device having a crystallized metallic silicide film. Segawa et al.’s failure to either expressly or inherently describe a gate stack having a non-crystalline metallic silicide film bars an anticipation rejection of claims 23, 25, and 27 under 35 U.S.C. § 102(b). *See, Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Similarly, claims 24 and 28 have been amended to recite “an amorphous metallic silicide film.” As the Official Action points out, an amorphous metallic silicide is non-crystalline. Just as Segawa et al. fails to teach a non-crystalline film, Segawa et al. fails to teach an amorphous metallic silicide film as claimed in amended claims 24 and 28. Claims 24 and 28 are not anticipated without such teaching. *See, Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Additionally, claims 24 and 28 teach a gate stack “substantially devoid of silicon clusters” which is not taught by Segawa et al. The lack of such teaching further precludes an anticipation rejection of claims 24 and 28.

Claim 26 recites a gate stack structure wherein the gate stack dielectric layer of the gate stack is substantially devoid of pitting. The Specification of the present application clearly indicates that the formation of pits in gate stack dielectric layers occurs because of the presence

of silicon clusters inside the metallic silicide film of the gate stack. *See, Specification*, page 5, lines 24-28. Elimination of the silicon clusters in the metallic silicide film results in the elimination of pits in the gate stack dielectric layers. Because Segawa et al. does not eliminate the formation of silicon clusters within the gate stack formations, it is inherent that pitting of the gate stack dielectric layer will occur. Furthermore, Segawa et al. does not teach, or even suggest, that the problems associated with pitting in gate stack dielectric layers can be solved. This lack of teaching precludes an anticipation rejection of claim 26.

ENTRY OF AMENDMENTS

The amendments to claims 24, 25, 26, and 28 above should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings and do not add any new matter to the application.

CONCLUSION

Claims 23 through 28 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicants' undersigned attorney.

Respectfully Submitted,



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